REMARKS

Claims 19-36 are now pending in this application. Claims 1-17 are rejected and are cancelled herein. Claim 18 is previously cancelled. New claims 19-36 are added. In so far as rejected and objected to claims are now cancelled, it is submitted that those rejections and objections are rendered moot.

NEW CLAIMS

The new added claims are drafted to avoid the bases for the prior rejections under 35 U.S.C. §112 and to better present the invention. In this regard, it is believed a brief explanation of the invention is warranted.

The present invention provides a radial aerodynamic bearing between a shaft and a sleeve and further provides a hub assembly wherein a rotor and a back yoke are arranged in fixed relationship to each other. The aerodynamic bearing generates little bearing noise and has a long life due to contactless rotation. The coil of the motor is coreless and when interposed between the rotor and the back yoke results in a coreless motor generating no eddy current due to a coreless constitution and the fixed relationship of the back yoke and the permanent magnets. Thus, the claimed arrangement of features provides a motor realizing a long life even with operation including repeated rotation and stopping.

In prior art, such as the Obata and Tanaka references, motors having a dynamic pressure bearing and a cored motor produce a side pressure which is

applied to the rotation center of the rotor due to mechanical dimensional accuracy of having a core. This causes a harmful friction force from contact within the bearing when the motor is turned ON/OFF, which in turn causes the bearing to wear and shorten its life. A coreless motor wherein the coil is without a core, in contrast to a motor with a coil wound around the core, results in no eddy current being generated from the core, enabling reduction of energy loss and heat generation occurring therefrom from the eddy currents.

The presently claimed invention of claims 19 and 26 provides for the following construction:

> a back yoke fixedly connected to said rotor via said hub member and arranged in fixed opposition to said rotor with said coil disposed between said back yoke and said rotor so as to define a magnetic circuit outside said sleeve and said shaft[.]

The mounting of both the rotor and the back yoke allows the magnetic circuit of the motor to be completed within the assembly of the hub, rotor and back yoke. Since the magnetic flux does not travel through the sleeve and shaft, the forces generated by such a flux on the sleeve and shaft are absent. Such forces in devices having flux travel through the relatively rotating structures of the sleeve and shaft adversely impact upon the bearing life, even a hydrodynamic bearing and even more so an aerodynamic bearing as presented in the present claims. The presently claimed construction allows use of an aerodynamic bearing which presents little friction.

Because the shaft and sleeve in the aerodynamic bearing do not contact each other, the friction of the bearing is low, reducing loss in comparison to a ball bearing.

On the other hand, with a coreless motor having a back yoke provided on a stationary side (i.e., base, etc.), an eddy current is generated from the back yoke since the rotor rotates relative the back yoke. The current invention is configured so that the back yoke rotates together with the rotor magnet; therefore, no eddy current is generated from the back yoke, enabling further reduction of loss.

The current invention is configured so that a radial aerodynamic bearing, magnetic axial thrust bearing of the first and second magnets, and coreless coil are combined, and the back yoke rotates in synchronous with the rotor magnet, thereby reducing loss caused by bearing friction as well as loss caused by eddy current generated from iron material (iron core around which a coil is wound, back yoke), lowering material costs, processing costs and assembling costs of the bearing, and reducing loss during rotation.

Still further, the present invention provides a magnetic axial thrust bearing composed of the first and second magnets. This allows the hub to be supported in a contactless manner which further reduces losses. Claims 21 and 25 further provide for " said first and second magnets being closed within said concavity by said radial aerodynamic bearing." This enclosing by the concavity of the hub and radial aerodynamic bearing protects magnetic thrust bearing from interfering dust entry.

Claims 23 and 27 recite that the "said first and second magnets are concentric, radially opposing one another, and provide axial thrust by attraction." This configuration further distinguishes the construction of the claimed invention.

Claims 30 and 34 are directed to the configuration of the invention "wherein said first and second magnets are arranged at a lower end of said shaft, said first magnet is disposed in an annular recess in an interior bottom portion of said sleeve and said second magnet is fixed to a bottom of said shaft." This arrangement of magnets is distinguishing of the claimed invention. Still further claims 32 and 36 provide that "said first and second magnets are concentric, radially opposing one another, and provide axial thrust by attraction." This configuration in conjunction with the other subject matter of the claims is consider to provide a synergistic combination not rendered obvious by previously applied art.

In summary, the present invention provides a combination of features not set forth in the applied art. The features include the coreless coil, the radial aerodynamic bearing, the magnetic axial thrust bearing, and the rotor and back yoke being relatively fixedly disposed on the hub so as to avoid generation of eddy currents in the backyoke and rotor, and also to avoid the flux path traveling through the shaft and sleeve and thereby avoid the harmful effects such force would have an aerodynamic bearing. It is the synergistic coalition of these features that provide a motor with extremely low friction and heat loss, improved service life and ease of production.

The cancelled claims have been variously rejected over the Obata, Tanaka, Ackerman, and Sung references. The Ackerman patent employs a thrust hydrodynamic bearing as a thrust bearing. The thrust hydrodynamic bearing requires a highly accurate machining and thereby increases material costs and processing costs, and thus is extremely expensive. Also, a thrust hydrodynamic bearing requires assembling accuracy on a high order, requiring very complicated assembling processes. The Ackerman reference further has the rotor magnets mounted on the sleeve 6a, and has the back yoke mounted to the base and not mounted to the hub. Thus, the magnetic circuit does not avoid the shaft and sleeve and flux generated forces occur.

Instead, the present invention employs a magnetic thrush bearing in combination with a radial aerodynamic bearing. The Ackerman reference fails to recognize the synergistic combination of the reduced forces produced on a sleeve and shaft by avoiding a magnetic circuit in the sleeve and shaft and the use of a radial aerodynamic bearing in combination with a magnetic thrust bearing. The thrust magnet (attraction type) as a thrust bearing reduces material costs and assembling costs. Also, little friction loss occurs during rotation.

The Obata reference also fails to teach the combination of the use of a radial aerodynamic bearing in combination with a magnetic thrust bearing, and a coreless

coil. The Obata motor uses cored coils and further uses a hydrodynamic bearing requiring the use of a dynamic liquid lubricant. Paragraph 98. Additionally, the flux travels through the shaft of the motor. Hence, this reference fails to provide a teaching of any of the above noted benefits of the claimed combination of features.

The Tanaka reference also uses a cored coil, and channels flux through the shaft. This references is therefore far removed from the presently claimed invention.

Thus, it is respectfully submitted that the new claims are not obvious in view of the previously applied references for the reasons stated above.

REQUEST FOR EXTENSION OF TIME

Applicant respectfully requests a two month extension of time for responding to the Office Action. **The fee of $450.00 for the extension is provided for in the charge authorization presented in the PTO Form 2038, Credit Card Payment form, provided herewith.**

If there is any discrepancy between the fee(s) due and the fee payment authorized in the Credit Card Payment Form PTO-2038 or the Form PTO-2038 is missing or fee payment via the Form PTO-2038 cannot be processed, the USPTO is hereby authorized to charge any fee(s) or fee(s) deficiency or credit any excess payment to Deposit Account No. 10-1250.

Docket No. F-7987 Ser. No. 10/673,780

In light of the foregoing, the application is now believed to be in proper form for allowance of all claims and notice to that effect is earnestly solicited.

Respectfully submitted,
JORDAN AND HAMBURG LLP

By _____
C. Bruce Hamburg
Reg. No. 22,389
Attorney for Applicants

and,

By _____
Herbert F. Ruschmann
Reg. No. 35,341
Attorney for Applicants

Jordan and Hamburg LLP
122 East 42nd Street
New York, New York 10168
(212) 986-2340

enc: Form PTO-2038.